

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

DEC. 5, 1949



U. S. Air Force's New ALBATROSS

Ask any air rescue pilot and he'll tell you rough water landings are the rule, not the exception. That's why the GRUMMAN ALBATROSS, designed for rescue work and other operations on the open sea, has the ruggedness and stability to operate in ocean-high waves.

The ALBATROSS is the newest member of the GRUMMAN family of famous amphibians.



GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPALE

Contractors To The Armed Forces

NEW! *High-Temp Nut* HOLDS WITHOUT SEIZURE AT 1200°F.



Self-locking Elastic Deflection protects against VIBRATION! permits INTERCHANGEABILITY!

The extreme heat generated in exhaust manifolds, turbine, fuel nozzles and similar units has been a source of strength and secure problems in engine, locomotive—problems that are solved by ESNA's New E-1200 Hex and Anchor Nuts.

These new nuts shown above on the left case flange of the General Electric T6-100 retain their strength and locking torque characteristics even after repeated use at 1200°F. They are readily removed . . . do not seize the bolt or damage the threads.

Further, the elastic deflection built into the E-1200's locking feature makes them reusable—interchangeably . . . because exact design assures locking

torque within the tolerance range of Class 2 bolts.

ESNA E-1200 Nuts—like all Elastic Stop Nuts—are designed for rapid field service replacement in a single minute action. They are self-locking anywhere on a bolt or stud without frictional and time lock stresses or nut pressure.

HOW'S A CHALLENGE? Send us complete details of your toughest bolted trouble spot. We'll supply test data—FREE, in no personal question. Or, if you want further information, write for literature.

Elastic Stop Nuts Corporation of America, Union, New Jersey. Representatives and Agents are located in many principal cities.



ELASTIC STOP NUTS



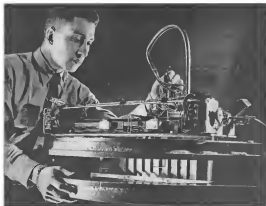
HOW TORQUE-PLUS NUTS, SIZE AND ANCHORS, LOCK CLASS 2 BOLT TYPE 177000

Stainless Steel type 18-8 Columbian exhibit, after placed the new ESNA E-1200 nut will NOT seize the bolt or gild the bolt. Washers, spacers or stress control will not disturb their pre-stressed or pre-tensioned settings.

THEY ARE REUSABLE



OVER 400 TYPES AND SIZES IMMEDIATELY AVAILABLE FROM STOCK



A QUEST FOR THE PERFECT "SHAPE"

► This search engineer is seeking the best suited shape for the small but easily-seized blades of a jet engine turbine at compression.

► This "wind tunnel" is the Wright Laboratories' test cell for the best blades at the speed of sound—an unusually high velocity for this type of equipment. The blades may be rotated in the airstream to change the angle of attack or may be assembled at various spacings to find the most efficient relationship between air and blade. Pressure readings behind the blades are picked up by a traversing probe and automatically recorded.

► There's a sound reason for this

large attention to small detail. For instance, a drop of one percent in the efficiency of the turbine section of a turbo-prop engine means a drop of three percent or more in shaft horsepower. The high speed of airflow is dictated by the fact that light weight gas turbines need the fastest possible compressor and turbine stages, which blade in turn is relatively higher speed of flow past the blades.

► This "outside" test is one of many ways in which Wright Aeronautical Laboratories help along the "Jet Age"—through aerodynamic testing, proving and improving of all parts and materials essential to efficient jet engine operation.



POWER FOR AIR PROGRESS

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Jet in figure on
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and related spark plug
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Aviation Week

Volume 31

December 3, 1969

Number 23

Headline News

U. S. Tankers Challenge to British 10
Civilians Offer New Version of XL-10 10
Air Corps Meeting Discusses Problems 16
Canada Helps Formers Jet Develop-
ment 22
New Details on British ITS 22

New Aviation Products

Rotameter Shows Critical Speed 10

Aviation Sales & Service

New Facility for Company Planes 17

Aeronautical Engineering

Wing Interference for High Speed 20
Jet Tests in Sand and Dust 22
New F-104 Test Facility 22

Air Transport

Industry Meets For Conference 10
Study on Airport Travel Times 10
Shocking Passenger Verdict Reported 10
Collected Before Court Judgment 10

Departments

What's New 1
Industry News 1
Aviation Calendar 1
New Airport 1
Engineering Forum 1

Editorial Board

Editorial Board

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212-691-1180, 212-691-1181, 212-691-1182, 212-691-1183, 212-691-1184, 212-691-1185, 212-691-1186, 212-691-1187, 212-691-1188, 212-691-1189, 212-691-1190, 212-691-1191, 212-691-1192, 212-691-1193, 212-691-1194, 212-691-1195, 212-691-1196, 212-691-1197, 212-691-1198, 212-691-1199, 212-691-1200, 212-691-1201, 212-691-1202, 212-691-1203, 212-691-1204, 212-691-1205, 212-691-1206, 212-691-1207, 212-691-1208, 212-691-1209, 212-691-1210, 212-691-1211, 212-691-1212, 212-691-1213, 212-691-1214, 212-691-1215, 212-691-1216, 212-691-1217, 212-691-1218, 212-691-1219, 212-691-1220, 212-691-1221, 212-691-1222, 212-691-1223, 212-691-1224, 212-691-1225, 212-691-1226, 212-691-1227, 212-691-1228, 212-691-1229, 212-691-1230, 212-691-1231, 212-691-1232, 212-691-1233, 212-691-1234, 212-691-1235, 212-691-1236, 212-691-1237, 212-691-1238, 212-691-1239, 212-691-1240, 212-691-1241, 212-691-1242, 212-691-1243, 212-691-1244, 212-691-1245, 212-691-1246, 212-691-1247, 212-691-1248, 212-691-1249, 212-691-1250, 212-691-1251, 212-691-1252, 212-691-1253, 212-691-1254, 212-691-1255, 212-691-1256, 212-691-1257, 212-691-1258, 212-691-1259, 212-691-1260, 212-691-1261, 212-691-1262, 212-691-1263, 212-691-1264, 212-691-1265, 212-691-1266, 212-691-1267, 212-691-1268, 212-691-1269, 212-691-1270, 212-691-1271, 212-691-1272, 212-691-1273, 212-691-1274, 212-691-1275, 212-691-1276, 212-691-1277, 212-691-1278, 212-691-1279, 212-691-1280, 212-691-1281, 212-691-1282, 212-691-1283, 212-691-1284, 212-691-1285, 212-691-1286, 212-691-1287, 212-691-1288, 212-691-1289, 212-691-1290, 212-691-1291, 212-691-1292, 212-691-1293, 212-691-1294, 212-691-1295, 212-691-1296, 212-691-1297, 212-691-1298, 212-691-1299, 212-691-1300, 212-691-1301, 212-691-1302, 212-691-1303, 212-691-1304, 212-691-1305, 212-691-1306, 212-691-1307, 212-691-1308, 212-691-1309, 212-691-1310, 212-691-1311, 212-691-1312, 212-691-1313, 212-691-1314, 212-691-1315, 212-691-1316, 212-691-1317, 212-691-1318, 212-691-1319, 212-691-1320, 212-691-1321, 212-691-1322, 212-691-1323, 212-691-1324, 212-691-1325, 212-691-1326, 212-691-1327, 212-691-1328, 212-691-1329, 212-691-1330, 212-691-1331, 212-691-1332, 212-691-1333, 212-691-1334, 212-691-1335, 212-691-1336, 212-691-1337, 212-691-1338, 212-691-1339, 212-691-1340, 212-691-1341, 212-691-1342, 212-691-1343, 212-691-1344, 212-691-1345, 212-691-1346, 212-691-1347, 212-691-1348, 212-691-1349, 212-691-1350, 212-691-1351, 212-691-1352, 212-691-1353, 212-691-1354, 212-691-1355, 212-691-1356, 212-691-1357, 212-691-1358, 212-691-1359, 212-691-1360, 212-691-1361, 212-691-1362, 212-691-1363, 212-691-1364, 212-691-1365, 212-691-1366, 212-691-1367, 212-691-1368, 212-691-1369, 212-691-1370, 212-691-1371, 212-691-1372, 212-691-1373, 212-691-1374, 212-691-1375, 212-691-1376, 212-691-1377, 212-691-1378, 212-691-1379, 212-691-1380, 212-691-1381, 212-691-1382, 212-691-1383, 212-691-1384, 212-691-1385, 212-691-1386, 212-691-1387, 212-691-1388, 212-691-1389, 212-691-1390, 212-691-1391, 212-691-1392, 212-691-1393, 212-691-1394, 212-691-1395, 212-691-1396, 212-691-1397, 212-691-1398, 212-691-1399, 212-691-1400, 212-691-1401, 212-691-1402, 212-691-1403, 212-691-1404, 212-691-1405, 212-691-1406, 212-691-1407, 212-691-1408, 212-691-1409, 212-691-1410, 212-691-1411, 212-691-1412, 212-691-1413, 212-691-1414, 212-691-1415, 212-691-1416, 212-691-1417, 212-691-1418, 212-691-1419, 212-691-1420, 212-691-1421, 212-691-1422, 212-691-1423, 212-691-1424, 212-691-1425, 212-691-1426, 212-691-1427, 212-691-1428, 212-691-1429, 212-691-1430, 212-691-1431, 212-691-1432, 212-691-1433, 212-691-1434, 212-691-1435, 212-691-1436, 212-691-1437, 212-691-1438, 212-691-1439, 212-691-1440, 212-691-1441, 212-691-1442, 212-691-1443, 212-691-1444, 212-691-1445, 212-691-1446, 212-691-1447, 212-691-1448, 212-691-1449, 212-691-1450, 212-691-1451, 212-691-1452, 212-691-1453, 212-691-1454, 212-691-1455, 212-691-1456, 212-691-1457, 212-691-1458, 212-691-1459, 212-691-1460, 212-691-1461, 212-691-1462, 212-691-1463, 212-691-1464, 212-691-1465, 212-691-1466, 212-691-1467, 212-691-1468, 212-691-1469, 212-691-1470, 212-691-1471, 212-691-1472, 212-691-1473, 212-691-1474, 212-691-1475, 212-691-1476, 212-691-1477, 212-691-1478, 212-691-1479, 212-691-1480, 212-691-1481, 212-691-1482, 212-691-1483, 212-691-1484, 212-691-1485, 212-691-1486, 212-691-1487, 212-691-1488, 212-691-1489, 212-691-1490, 212-691-1491, 212-691-1492, 212-691-1493, 212-691-1494, 212-691-1495, 212-691-1496, 212-691-1497, 212-691-1498, 212-691-1499, 212-691-1500, 212-691-1501, 212-691-1502, 212-691-1503, 212-691-1504, 212-691-1505, 212-691-1506, 212-691-1507, 212-691-1508, 212-691-1509, 212-691-1510, 212-691-1511, 212-691-1512, 212-691-1513, 212-691-1514, 212-691-1515, 212-691-1516, 212-691-1517, 212-691-1518, 212-691-1519, 212-691-1520, 212-691-1521, 212-691-1522, 212-691-1523, 212-691-1524, 212-691-1525, 212-691-1526, 212-691-1527, 212-691-1528, 212-691-1529, 212-691-1530, 212-691-1531, 212-691-1532, 212-691-1533, 212-691-1534, 212-691-1535, 212-691-1536, 212-691-1537, 212-691-1538, 212-691-1539, 212-691-1540, 212-691-1541, 212-691-1542, 212-691-1543, 212-691-1544, 212-691-1545, 212-691-1546, 212-691-1547, 212-691-1548, 212-691-1549, 212-691-1550, 212-691-1551, 212-691-1552, 212-691-1553, 212-691-1554, 212-691-1555, 212-691-1556, 212-691-1557, 212-691-1558, 212-691-1559, 212-691-1560, 212-691-1561, 212-691-1562, 212-691-1563, 212-691-1564, 212-691-1565, 212-691-1566, 212-691-1567, 212-691-1568, 212-691-1569, 212-691-1570, 212-691-1571, 212-691-1572, 212-691-1573, 212-691-1574, 212-691-1575, 212-691-1576, 212-691-1577, 212-691-1578, 212-691-1579, 212-691-1580, 212-691-1581, 212-691-1582, 212-691-1583, 212-691-1584, 212-691-1585, 212-691-1586, 212-691-1587, 212-691-1588, 212-691-1589, 212-691-1590, 212-691-1591, 212-691-1592, 212-691-1593, 212-691-1594, 212-691-1595, 212-691-1596, 212-691-1597, 212-691-1598, 212-691-1599, 212-691-1600, 212-691-1601, 212-691-1602, 212-691-1603, 212-691-1604, 212-691-1605, 212-691-1606, 212-691-1607, 212-691-1608, 212-691-1609, 212-691-1610, 212-691-1611, 212-691-1612, 212-691-1613, 212-691-1614, 212-691-1615, 212-691-1616, 212-691-1617, 212-691-1618, 212-691-1619, 212-691-1620, 212-691-1621, 212-691-1622, 212-691-1623, 212-691-1624, 212-691-1625, 212-691-1626, 212-691-1627, 212-691-1628, 212-691-1629, 212-691-1630, 212-691-1631, 212-691-1632, 212-691-1633, 212-691-1634, 212-691-1635, 212-691-1636, 212-691-1637, 212-691-1638, 212-691-1639, 212-691-1640, 212-691-1641, 212-691-1642, 212-691-1643, 212-691-1644, 212-691-1645, 212-691-1646, 212-691-1647, 212-691-1648, 212-691-1649, 212-691-1650, 212-691-1651, 212-691-1652, 212-691-1653, 212-691-1654, 212-691-1655, 212-691-1656, 212-691-1657, 212-691-1658, 212-691-1659, 212-691-1660, 212-691-1661, 212-691-1662, 212-691-1663, 212-691-1664, 212-691-1665, 212-691-1666, 212-691-1667, 212-691-1668, 212-691-1669, 212-691-1670, 212-691-1671, 212-691-1672, 212-691-1673, 212-691-1674, 212-691-1675, 212-691-1676, 212-691-1677, 212-691-1678, 212-691-1679, 212-691-1680, 212-691-1681, 212-691-1682, 212-691-1683, 212-691-1684, 212-691-1685, 212-691-1686, 212-691-1687, 212-691-1688, 212-691-1689, 212-691-1690, 212-691-1691, 212-691-1692, 212-691-1693, 212-691-1694, 212-691-1695, 212-691-1696, 212-691-1697, 212-691-1698, 212-691-1699, 212-691-1700, 212-691-1701, 212-691-1702, 212-691-1703, 212-691-1704, 212-691-1705, 212-691-1706, 212-691-1707, 212-691-1708, 212-691-1709, 212-691-1710, 212-691-1711, 212-691-1712, 212-691-1713, 212-691-1714, 212-691-1715, 212-691-1716, 212-691-1717, 212-691-1718, 212-691-1719, 212-691-1720, 212-691-1721, 212-691-1722, 212-691-1723, 212-691-1724, 212-691-1725, 212-691-1726, 212-691-1727, 212-691-1728, 212-691-1729, 212-691-1730, 212-691-1731, 212-691-1732, 212-691-1733, 212-691-1734, 212-691-1735, 212-691-1736, 212-691-1737, 212-691-1738, 212-691-1739, 212-691-1740, 212-691-1741, 212-691-1742, 212-691-1743, 212-691-1744, 212-691-1745, 212-691-1746, 212-691-1747, 212-691-1748, 212-691-1749, 212-691-1750, 212-691-1751, 212-691-1752, 212-691-1753, 212-691-1754, 212-691-1755, 212-691-1756, 212-691-1757, 212-691-1758, 212-691-1759, 212-691-1760, 212-691-1761, 212-691-1762, 212-691-1763, 212-691-1764, 212-691-1765, 212-691-1766, 212-691-1767, 212-691-1768, 212-691-1769, 212-691-1770, 212-691-1771, 212-691-1772, 212-691-1773, 212-691-1774, 212-691-1775, 212-691-1776, 212-691-1777, 212-691-1778, 212-691-1779, 212-691-1780, 212-691-1781, 212-691-1782, 212-691-1783, 212-691-1784, 212-691-1785, 212-691-1786, 212-691-1787, 212-691-1788, 212-691-1789, 212-691-1790, 212-691-1791, 212-691-1792, 212-691-1793, 212-691-1794, 212-691-1795, 212-691-1796, 212-691-1797, 212-691-1798, 212-691-1799, 212-691-1800, 212-691-1801, 212-691-1802, 212-691-1803, 212-691-1804, 212-691-1805, 212-691-1806, 212-691-1807, 212-691-1808, 212-691-1809, 212-691-1810, 212-691-1811, 212-691-1812, 212-691-1813, 212-691-1814, 212-691-1815, 212-691-1816, 212-691-1817, 212-691-1818, 212-691-1819, 212-691-1820, 212-691-1821, 212-691-1822, 212-691-1823, 212-691-1824, 212-691-1825, 212-691-1826, 212-691-1827, 212-691-1828, 212-691-1829, 212-691-1830, 212-691-1831, 212-691-1832, 212-691-1833, 212-691-1834, 212-691-1835, 212-691-1836, 212-691-1837, 212-691-1838, 212-691-1839, 212-691-1840, 212-691-1841, 212-691-1842, 212-691-1843, 212-691-1844, 212-691-1845, 212-691-1846, 212-691-1847, 21



FOREMOST IN SCIENTIFIC DEVELOPMENT

IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN-FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
FORGING DESIGNS, WHICH AT
THE TIME OF THEIR DEVELOPMENT
WERE CONSIDERED IMPOSSIBLE
TO PRODUCE BY FORGING.

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FORGINGS OF ALUMINUM • MAGNESIUM • STEEL
WORCESTER, MASSACHUSETTS
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WHO'S WHERE

Changes

► **New Appointment—Giffen Inc., Inc.**, has named T. T. "Tom" Dwyer assistant sales and representative superintendent to serve Boeing Aircraft Co. at Seattle. Tom Dwyer was assistant manager of engine development and the Pacific Coast district of Trueman Products, Inc. (United Aircraft Products, Inc.) appointed from E. Whitcomb as engine segment representative. Group J. G. Gower is manager of industrial relations and Frank S. White manager of industrial engineering for Robert Gray Co., Inc. Henry G. Gower was assistant chief engineer and assistant manager for Trueman Alloy Manufacturing Co., Inc. W. S. Whitcomb, Jr., formerly American Airlines' district sales manager at Buffalo, is now assistant to the vice president in the corporation's Washington, D. C. administrative office.

General Electric has appointed E. R. Law manager of manufacturing for its Automatic and Continuous Systems division, succeeding Frank T. Lewis, now manager of manufacturing in the Small Appliance division. Law was formerly assistant to the manager of manufacturing for the division. Jack Weiss, a new assistant manufacturing representative for the American Aircraft Corp., is also assigned to the division.

► **Sales & Advertising—The Bell Co., Inc.** has appointed Frank Bente advertising copy writer with offices in New York. Bellanca Aircraft named A. G. Ryan director of sales and Anne Lechner publicity chief manager.

► **Chief Engineer—The Bell Co., Inc.** has named E. R. Law chief engineer replacing E. W. Kinsdale, now the company's chief engineer. Harry J. Dwyer is now manager of advertising and sales promotion for the Washington Electric Corp., Pittsburgh.

► **Engineer—C. W. Menden**, corporate vice president and assistant of the board at Northrop Aircraft, Inc., has resigned to devote full time to other business activities. Harvey D. Cook, chief engineer for the Pacific Aircraft division of FAA, will resign Jan. 3, 1950 to open his own public relations and management consulting firm in San Francisco. FAA will be one of the first clients of Harwood and Associates.

Elections and Honors

► **New Board Member—Capital Airlines** has elected Gerald T. Johnson, Jr., a director. Mercury Manufacturing Co. director elected William B. Dwyer to the office of assistant to the president and assistant sales manager.

► **Honors—Dr. Edward E. Sharp**, managing director of the Lewis Flight Propulsion Lab (NAACA), a space ground element of the National Model Plane Exhibit contest. —Robert C. Phillips, Jr., president of Aerovox Engineering Corp., has been named chair man of the August Committee of the Washington (D. C.) Road of Youth.

INDUSTRY OBSERVER

► **Convair's 240** after crew has ditched a proposed Convair-Lear sales flight to South America temporarily for a more immediate 16-day sales demonstration in Brazil, Delta and Mid-Continent. It will fly regular DC-3, DC-4 and DC-6 schedules with a demonstration 240 from San Diego to Miami and others, via Dallas, Atlanta, and Kansas City.

► **Gyalogis Co.** of Amherst at Hicksville, N. Y., is completing a prototype motorized called the Helioflyer, which, it is claimed, will be able to cruise at 150 mph in addition to having helicopter characteristics of hovering and vertical landing and takeoff. The two-engine prototype is designed for single-engine performance, and is expected to enter 12 prototype.

► **FWA** will use 68 prototype DC-4s in its proposed transcontinental direct flight, scheduled to start Dec. 27, and a new negotiating purchase of several DC-4s. Convair has 44 to 50 units in passenger cabin will take place in the airline's Kansas City shops.

► **Timberline** recommendations for standardization by Air Force and Navy as a dual system of cockpit lighting, using individual instrument shields with red lighting, and an additional system of red flood lighting, have been made by the cockpit layout panel for the Mustang-based. Action recommendations followed from down in October at Wright-Patterson AFB and Clinton County (Ohio) AFB using three Boeing B-17s and two Douglas AD-1s with various Navy, Air Force and commercial airline cockpit lighting systems.

► **Installation of a single "light" "roof"** of approach lights at airports where installation of a light intensity system is not considered profitable will be proposed by the U. S. to ICAO. Proposed is a low light system suitable to make the system visible not less than 3900 ft. from the runway threshold, with lights spaced not over 500 ft. apart, and with the system length not less than 1000 ft.

► **All American Airways**, which makes first landings and takeoffs as low as its routes, is conducting a campaign with its flight crew to extend the life of its fleet by better landings. Meanwhile, by changing to Goodyear tires and using nylon tires instead of rayon tires, the airline has a saving 120 lb. of weight per plane.

► **North American Aviation** has developed a new trouble-shooting device to check rotor wiring in B-47 bombers, which reduces the check time from 340 man-hours to 5 man-hours. USAF has ordered 29 of the devices for use in various types of planes. Dwyer checks continuity to detect complete wire breaks and leakage. It is portable and can operate from the airplane's battery in any power position.

► **USAF** supply and maintenance specialists from AMC headquarters, after more than two weeks of maintenance at Boeing-Wichita, produced a spare parts list for the latest Boeing B-47 bomber which includes 1749 different items, and have placed initial quality orders for each item. Some of the spares will be delivered to the USAF before the first production model B-47 goes into service.

► **Canadair Ltd.** of Montreal is still hoping for a deal with Fairchild in licensing of C-119 manufacture in Canada. Canadair was rebuffed by the old Fairchild management on its initial approach six months ago but plans to try again with the new management. By point of view in previous negotiations was whether Fairchild would be adequately protected against Canadair competition in the U. S. and Latin American export markets.

► **The French Dassault MD-450 jet fighter** is being tested at Boeing's government test center, and reportedly has attained a speed of 590 mph and an 8400 ft./min. rate of climb. Second prototype, due to fly shortly, is expected to reach a maximum speed of 600 mph.

► **USAF** is looking heavily on universities for basic research on many of its problems. North Dakota is doing research on transonic shock University of Rochester is studying high altitude engine requirements, and the University of Michigan is working on aircraft control systems and problems of jet engine fuel analysis and spin problems.

A highlight of the forthcoming Maui All American Air Showers will be the Gulfstream Aerospace Contest, sponsored by our division of company.



It's open to all—both men and women as an even team. The pilot can be of any make—with any power plant. Complete details and query blanks can be obtained from the Miami All American Air Museum, Inc., Room 415 Professional

Qualifying trials will be held January 12th to the 15th. Then, during the Mid-winters (January 19-21), those who have qualified will compete with one another for the title and the prize.

About those prizes—there will be no plays and \$1500.00. The money will be divided as follows: \$1750 on the first place winner, \$675 on the second-place winner, \$375 for third, and \$150 for fourth.

Sounds interesting! Well, not very young, but looks just as brave as all the "safe" and so official ones. Thank You : write us. Do write All American Air Masters, Inc., Room 401 Peoria Street, Peoria, Illinois.

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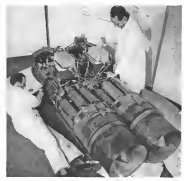
By Robert Hulse

Indianapolis—United States jumped to a second lead in the international turboprop competition here last week with the announcement of the Allison T-56 and T-40 engines.

The Allison technology program, sponsored by the Navy Bureau of Aeronautics, has produced two turbojet engines that are superior to anything yet manufactured by British engine makers in weight per horsepower, size and in its specific fuel consumption. The Allison turbojets now have about 25 hours flight test time and 1700 hours of test stand running. They are expected to go into mass production in the near future.

These engines are scheduled to power a new generation of Navy attack planes and already show promise of leading off a rapid U.S. development of military and commercial turbo-prop powered transports.

- The T-38, an oval low-boom aircraft,



Convair Redesigns Big Transport

Modification of XC-99, competitor of C-97 and C-124, would haul 100,000 lb. over trans-Atlantic distance.

Convair has entered the stiff competition on long range strategic military transports with a proposal for redesign of the investigation XC-99, transport counterpart of the B-36 bomber.

The new version of the joint transport will be called the C-99 and has been redesigned for mass production and transport of a 100,000 lb payload over trans-Atlantic distances, and 150,000 lb over shorter distances.

The C-99 has the following major changes over the experimental XC-99:

- **Main Powered Engines:** The XC-99 is now being fitted with Pratt & Whitney R4550-49 engines, rated at 3500 hp, at the San Antonio USAF depot. The C-99 is scheduled to get a new model of the B-454 rated at more than 4000 hp. In addition to the increased horsepower, the VDT engine allows greater fuel economy increasing the range of the C-99.

- **Redesigned Fuselage:** The fuselage has been redesigned to offer more cargo bay cargo and permit penetration of the upper deck for transport of troops and hospital cases. The lower deck would be reconfigured.

- **New Wing Design:** The new wheel installation has been levered so that it doesn't protrude into the lower cargo compartment. It is housed in a wing under the foreleg body that looks more like a tail fin.

- **Increased Range:** The C-99 is designed to carry a 100,000 lb payload over a 1000 statute mile range. The XC-99 has already hauled a 100,000 lb payload on a test flight but can carry it over much shorter ranges.

- **New Loading Equipment:** The C-99 will be equipped with integral loading ramps and clamshell doors in both nose and tail. These will permit vehicles, including the largest Army trucks and USAF trailers, to be driven under their own power into the lower cargo compartment. Electric hoists in the lower compartment will facilitate loading and unloading of other types of cargo.

- **Main Cargo Door:** The redesigned C-99 fuselage will offer 57 percent more cargo space than the XC-99.

- **New Cockpit:** The C-99 will incorporate the bubble canopy of the B-36 and a smaller three level flight deck.

- **Automation:** The cockpit and upper cargo compartment will be particu-

larly automated by personnel during high altitude, long range flights. Chief advantage is that it will allow personnel who operate combat equipment stored in the lower cargo compartment. This permits the C-99 to deliver combat equipment, including tanks and their operating and maintenance personnel, to an airfield and would eliminate the conventional staging area that is now both a large part of the ground force overhead cost. Automation would also enable the C-99 to operate on stress loads as a hospital ship carrying 500 beds and 35 medical attendants.

Carrying a cargo load in the lower compartment, the C-99 is designed to carry 157 troops in the upper compartment. Total troop capacity in both compartments is 351 troops with full equipment.

The C-99 will face stiff competition in the strategic transport field from the

Douglas C-124A and the Boeing C-97, both of which have already been bought by the USAF. Redesign of the C-99 was done by a Convair PT. Wright division engineering team headed by J. W. Larson, chief engineer at Ft. Worth.

• **Use B-36 Tooling:** It is estimated that about 70 percent of the B-36 parts and tooling could be used in the production version of the C-99. Preliminary price estimates, on this basis, indicate the C-99 would cost USAF about \$15 million and be competitive with the Douglas and Boeing entries at the price level.

The C-99 is designed to meet the same need for trans-Atlantic airlift of Army combat equipment and troops (Atlantic Warfare, Nov. 28) and is based on the Army concept of delivering troops and equipment ready to fight. Among the large pieces of Army equipment the C-99 can accommodate in its lower compartment: 100 mm howitzer (2), 120 mm sub mortar gun with supplementary equipment (10), armored vehicle M-49 (2), amphibious cargo carrier (3), USAF 30 ton trailer (4), main ship (2), tank recovery vehicle with support equipment (1), 4 x 4 cargo truck (8) and one each of the 60,000 lb. M-45 and M-46 trucks.

• **Large Space:** Cargo docks at both ends would provide a 12 x 13 ft entrance space. Cargo compartments would be 21,774 cu ft at usable space. On the trans-Atlantic level a fleet of 44 C-99s could transport an entire airborne division of 175,000 men and equipment. The C-99 would be equipped with the same double tandem landing gear now used on the B-36 to eliminate asymmetry for ground runway strength and length requirements. It is also designed to take a special track loading gear now being built for the B-36. Wingspan would be the same 210 ft of the B-36 but the foreleg would be 183 ft long and 17 ft high—about 1 ft longer and 10 ft higher than the B-36. The C-99 would give 107,000 lb.

The Convair proposal has been submitted to USAF but there has been no decision as yet as to whether USAF will buy the joint transport to solve its trans-Atlantic airlift problem. Convair has also designed a passenger version for a 400 passenger aircraft for commercial airlines, one which would permit air coach fare equivalent to that of auto bus lines.

The aircraft was built under a Navy contract for the High Speed Flight Research Program which operated for the Navy, U.S. Air Force and the National Advisory Committee for Aeronautics. It features an extremely low aspect ratio, sweptback wing and is powered by a General Electric 547 turbojet engine rated at 5200 lb static thrust and a Reaction Motors five barrel rocket motor rated at 6800 lb static thrust.

Developed for the Navy, the aircraft was built by Douglas Aircraft Co. It is a high speed research plane that recently held the world speed record at 680 mph. Douglas has built three Skyrocket and three Skyhawk.

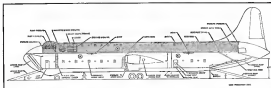
British Air Exports

Britain's airplane and engine exports are taking a sharp rise. September exports valued at \$9,345,625 set the total for the first nine months to \$165,073,521.15—over \$4 million higher than the annual export dollar value for 1945. Exports include both military and civil exports.

New Features Proposed for C-99....



CONVIAIR C-99 would haul 100,000 lb. payload nearly 4000 miles. Under plus, cargo and personnel would be accommodated in



TWO DECK, upper are provided in combat troops can accompany equipment stored in lower hold. Loading would be through



Tail, clamshell door, with self-contained ramp, and



NOSE door of same type, also with integral ramp.



First Details On Bristol 175

Choice of Proteus turboprops or Centaurus piston engines offered by maker on new 50-62 seater.

First details on the Bristol Aeroplane Co.'s 175 indicate the 78-passenger all-steel jetliner, 53 of which are on order by British Overseas Airways Corp., can be easily converted to accommodate 62 passengers.

Bristol will offer a choice of powerplants on the craft: four Proteus turbo-prop engines or four Centaurus 665 piston engines. Both models will have a pressurized fuselage, full feathering and reversing propellers, and a wide range of radio and radar equipment.

Performance is given as follows by Bristol:

• With the turboprop, the 175 will be capable of carrying a 17,510-lb. payload over a distance of 2649 mi. in 101 mi. at a cruise cruising speed of 339.25 mph

and at a cruise altitude of 20,000 ft. • With piston engine power, the craft can carry the same payload at altitudes

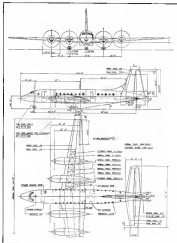
up to 23,000 ft. over a distance of 2649 mi. in 101 mi. at a cruise cruising speed of 296.7 mph.

Payload of 17,510 lb. works out:

- 53 passengers at 160 lb. each 8480 lb.
- Personal baggage at 5 lb. each 265 lb.
- Heavy baggage at 50 lb. each 2650 lb.
- Food and bar stock at 50 lb./passenger 2650 lb.
- Freight, mail and baggage 5610 lb.

With the turboprop power, Bristol says the 175 can clear a 50-ft. obstacle within a distance of 4200 ft. taking off in still air from a paved runway at sea level. This distance increases to 5600 ft. in an ambient temperature of 27 deg. C when taking off in still air from a level runway at a pressure altitude of 5300 ft.

Using the Centaurus, the craft can clear a 50-ft. obstacle in 4100 ft. take-off at sea level, with the distance increasing to 5649 ft. in an ambient temperature of 27 deg. C at pressure altitude of 5300 ft.



Aerodynamic Data Bristol 175

Wings	
Gross area	2055 sq. ft.
Maximal span	140 ft.
Aspect ratio	9.81
Shedded mean chord	14 ft. 6 in.
Taper ratio	0.333
Root section	NACA 21017
Tip section	NACA 4413 mod.
Alarons	
Area each	70 sq. ft.
Span each	20 ft. 6 in.
Fuselage	
Length	114 ft.
Maximum diameter	12 ft.
Tail Surfaces	
Class area	
net element	588 sq. ft.
Aspect ratio	5.45
Area each element	33 sq. ft.
Span	15 ft.

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AERONAUTICAL ENGINEERING

Smooth Wing: High Speed Requirement

Necessity for aerodynamically clean surface poses problems for designer, manufacturer and operator.

By Robert McLauren

Whether tomorrow's surface is turbulent or turbulence-proof, one requirement is a completely-smooth wing must be smooth. The supersonic fighter, the highspeed jet bomber, the long range missile must have smooth surfaces that are not only built that way but must be kept that way. For, research has shown that if early highspeed flight is to become practical, "oil caning," bent marks and twisted surfaces must go.

There are only two basic requirements for really high speed flight: high power and low drag. Whereas the former is available in the realm of subsonic flight, the latter has become available only through two decades of intense research and concentrated effort.

Most of the drag of a wing is caused by the boundary layer, a thin sheet of air close to the wing surface, which moves with a velocity less than that of the freestream.

Flow within this boundary layer may be either laminar or turbulent, depending upon a number of factors. The boundary layer near the forward part of a wing is laminar but undergoes a transition to turbulence at some point along its path. Since friction of a laminar boundary layer is less than that of a turbulent layer, it follows that the further out along the wing the laminar flow can be preserved, the lower the friction drag of the wing.

Laminar Flow on P-1—Although this concept is generally known today, it was its expression in a practical tool for the aerodynamicist by Ludwig Prandtl, of the National Advisory Committee for Aeronautics Langley Laboratory in 1917 that set in motion a vast chain of events. It culminated in the sudden appearance of fighter aircraft (North American P-51 Mustang) very late in March, 1944, a fact which aviation experts, including Goering himself, had fully predicted impossible. It was Prandtl's "laminar flow" which set the Mustang that made this accomplishment possible.

In the direction of actual actions having laminar boundary layer extension to a point well out, it is essential that equipment capable of detecting

the transition point be available. This means that the turbulence level of the wind tunnel must be vanishingly small so small that the appearance of turbulent boundary layer flow over the model be detectable.

Early Studies—Effects of flow turbulence were first discovered by Lord Osborne Reynolds in 1883, but its association in a wind tunnel problem did not appear until 1911, when G. Eiffel first published results of drag measurements on a sphere in his low speed tunnel.

These results were immediately questioned by the Götting group, whose results were at variance with those of Eiffel. It was not until 1914 that the cause of the discrepancy was clearly outlined—the turbulence level of the two tunnels were considerably different.

This related turbulence in a major criticism in the comparison of various wind tunnel results. In 1923 the British National Physical Laboratory conducted two similar models in all of the important wind tunnels in the world to obtain results in a common model. The consequent wide variance in data given the U.S. results varied by 50 percent from a series of tests closely established turbulence levels in the model and set investigations to develop methods of turbulence measurement and prediction.

U.S. Approach—Concerning this work, was Dr. Hugh B. Dryden, now NACA Director of Aeronautical Research, but for 36 years director of aerodynamic activities at the National Institute of Standards.

He adapted the principles of the low speed aerodynamic to the supersonic

measurement of wind tunnel turbulence and then pointed the way toward effective controlling of wind tunnel results, thereby reducing this research tool to accurate instrument rather than a noisy cylinder choked through which air is blown.

British Studies—The British took their most direct approach to the problem of boundary layer research by conducting flight tests in 1917 on a specially instrumented Heinkel Heist military airplane.

Advantage of this method became obvious when it is borne in mind that, for purposes of aerodynamic research, turbulent air can be considered surface free. These experiments showed clearly the two major characteristics of the boundary layer of wings: the point at which transition from laminar to turbulent flow taking place is a major criterion of wing drag, and subsequently minute variations in wing configuration can create this transition.

In the British trials, conducted by R. M. Jones, transition was made to occur by a wire only 8/16 in. diameter attached upstream in the wing and, in another test, by the attachment of this paper strip to the wing. Later, British tests were a Bell P-43 Kingcobra, fitted with a NACA ducting instrumented profile, revealed that transition to turbulence could be caused by small parts of the "hot" bodies stuck in the wing and the test was continued by the winging the paper, which was released by pulling a string after the plane had climbed about 7000 ft., the 30 "critical altitude" under the conditions of the test.

New Phase in Aviation—On the basis of these studies, Jacobs designed the NACA two-dimensional low turbulence tunnel at Langley Lab, which began operation in April, 1933. This tunnel, which later served as a model for the NACA two-dimensional low turbulence pressure tunnel, featured an exceptionally large area reduction ratio (19.6 to 1), a honeycomb and dense screen forward of the entrance cone to reduce turbulence to a minimum.

Jacobs and his staff (Friedrich, von Dornhoff, Abbott, Stutz, Babson, Allen, Rickard and Kestel) had designed a series of airfoils calculated to allow the transition to a point well aft. First tested in the new tunnel exhibited a measured drag coefficient of 0.003, about 34 percent less than had



been measured previously on an actual piece of comparable structure."

This test result marked an entirely new era in aviation, and June, 1935, was rightly be claimed the beginning of the high-speed era in aviation design.

Essential tests at this and other levels produced the well-known NACA 6-series and 7-series airfoils, now in use on all jet aircraft in the U. S. in various modified forms.

► **Smoothness Factor**—Throughout all of these tests it was clear that large drag increments result from surface roughness. Although much of this drag increment results from the character of the transition point forward, it also revealed that surface roughness also can cause drag increases in regions of turbulent flow, so that a smooth surface from leading to trailing edge is essential for the maintenance of low drag on an airfoil.

In the design of smooth wings, first problem is a suitable definition of the word "smooth" in relation to its function of transition. Contrary to widely quoted opinions, polishing or waxing does not improve the drag characteristics of a wing that is already smooth. For obvious reasons, it can provide improvement in wings that are not aerodynamically smooth.

In general, small protuberances on the general surface level of the airfoil are more likely to cause transition than will small depressions. Thus, dust particles are more apt to cause transition than will scratches, provided the scratch edges do not protrude above the surface. The general rule is that any irregularity that may be felt by the hand at the leading edge drawn across the wing surface is sufficiently large to cause transition.

The test for suitable character of transition in a wing section (as distinguished from level conditions described previously) is to rock a straightedge over the wing surface. The straightedge should rock smoothly without getting or catching, in which event the straightedge should prove free of waviness acquired for tradition.

► **Limitations**—It is evident that wing smoothness, so matter how essential requirements, must have serious limitations from the point of view of the manufacturer and the user.

For example, tests show that the positive parasite drag coefficient of the Grigorovich wing at trailing edge roughness was 0.0075 to 0.0080 over a range of lift coefficients from 0.1 to 0.5. Thus, the wing was smoothed and this introduced a roughness that lowered the drag coefficient to 0.005 to 0.006 at the velocity of $C_L = 0.1$, a reduction of about 30 percent.

After this, a typical test portion of

the wing was cleaned down to the metal surface, given two coats of primer paint and then a paint-type filler was sprayed on.

Lead areas found to be too small then rubbed down with coarse rubbing blocks mounted on cardboard paper. Following this special treatment, wing drag was lowered to 0.00415, a further reduction of about 50 percent, and a total drag reduction over the original "in-service" condition of about 70 percent.

While the degree to which wing drag can be reduced (and performance correspondingly increased) through improvement in wing smoothness is truly remarkable, it is evident that this ultimate treatment cannot be preserved either in production or under service conditions.

► **Parasite Checked**—It was to examine the practical aspects of this problem that NACA obtained a series of wing sections of conventional structure from a group of manufacturers. These "typical construction" panels covered an extremely wide range of structural design, including variations in spar location, stringer, stiffener type, riveting methods, skin types, etc. In most cases these were simply segments of wings in current production. To augment these test sections, the NACA Langley Lab staff prepared other sections employing the NACA design methods.

Theoretical calculations predicted the accompanying gaps, which shows the section drag coefficient for an NACA 65-116 airfoil at various chordwise positions of transition. This curve was used to correlate the tests of the practical construction panels. In most cases, the drag of these wing panels exhibited a drag coefficient varying between 0.005 and 0.005 in the "in-service" condition, indicating the degree of surface roughness actually to be expected from conventional fabrication methods in one of the lines of drag tests.

► **Procedure Used**—To determine practical methods by which characteristics could be improved, NACA applied five different operations to the sections and the reductions in drag provided by each operation were noted.

These methods ran pointing with synthetic-emulsion compounds, paint sanding the surface sufficiently to remove paint spots and surface irregularities, sand blast defects such as rivets, rivet dimples and seams by filling with Pycobond putty and sanding smooth, painting with gray primer sand and sanding smooth with No. 120 carborundum paper, and being either by extensive use of Pycobond putty or sandblasting to reduce the surface irregularities.

These applications provided progress-

ive improvement in drag characteristics, depending upon the individual section, of as much as 52 percent over the in-service section. The tests showed that such applications can reduce the drag characteristics of practical construction wing sections to values closely approaching that of smooth wind-tunnel test models. Degrees to which each of all of these operations are used depends upon the individual choice of the manufacturer and producing agency, with various values of the drag available upon which to make such particular decisions.

► **Comparative Load Effect**—The next question that arose in the problem is the effect of compressive loads on the drag characteristics of smooth wings. To answer this question the NACA subjected two test panels to progressive loads, alternating with wind-tunnel tests, up to buckling.

These tests indicate that compressive loads up to permanent deformation do not have a serious effect on the drag characteristics of the wing, but loads sufficient to produce permanent deformations can bring about a sharp increase in drag.

These studies also revealed, however, that the extent to which compressive loads increase the drag characteristics of a wing depend on part on the type of structure used as it affects wing stiffness.

As would be supposed, wing panels fitted with denser booms showed a definite effect on drag characteristics, with values as high as 40 percent drag increase.

► **Structures Studied**—Since the foregoing indicates that the type of structure plays an important part in the degree to which wing bending produces drag increase, it is of interest to examine the relationship between various skin thicknesses, stringer and rib spacing and wing smoothness.

A British study of this problem by Dr. D. M. A. Leggett indicates that there does exist certain ranges of these variables producing favorable drag characteristics. Two types of structure are compared—a conventional strand-line arrangement of two spars, conventional staggered ribs and spacing, and a similar structure using only chordwise stiffening.

Results of these analyses indicate that for the first type of structure, two ribs at best occurred by the use of 0.025-in. skins with stringers at 4-in. pitch, or 0.025-in. skins with 3-in. rib-ribs spacing.

The second type of structure, with chordwise stiffening only, proves a definite disadvantage and data studies indicate that it is not suitable for low-drag wing structures because of its low bending resistance and consequent ex-

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Jets Tested for Sand, Dust Damage

Gas turbine engines being new problems in desert operations. Test runs indicate need for more study.

The Air Materiel Command, studying the effects of sand on piston engines in World War II, is waiting no time finding out how the turbojet powerplant will stand up to desert operations.

Preliminary investigations by AMC with J-47 GE-1 and J-35 A-13 turbojet motors that gas turbine may not be equally or grossly affected by dust or sand, but they still are affected sufficiently to warrant serious future study of the turbojet-sand problem.

Because of differences between turbojet and piston engines, a great amount of data collected during the past eight years concerning operating engine life under desert conditions goes for naught to what may happen to a gas turbine under the same circumstances.

While grainy elements of the primary component would seem to be an advantage, the higher temperature generated by the engine that sand causes may gradually alter inlet dust dimensions, so that thrust depends so much, apparently, on definite characteristics when compared to the piston engine.

J. E. DeKoven, AMC project engineer pointed out in a paper delivered recently at the Society of Automotive Engineers National Aerodynamic Meeting in Los Angeles that the problem is made particularly difficult because all attempts to remove sand and dust from the air in it, either the jet "appear to be hopeless." Turbine performance in its present stage of development is too dependent on maximum inlet dust efficiency to permit filter installation.

On the basis of preliminary data obtained in the J-47 and J-35 tests, DeKoven believes a very suitable approach to the problem for the present is to:

- Use high engine content materials in the critical areas of the engine, such as the compressor.
- Allocate sand and dust troubles in low dust concentration areas by considering location and type of dust sources.
- Measure dust effects on the determination of performance of the basic engine, and secure data to determine engine constant requirements and reliability for predictive purposes.
- Obtain data on engine materials to determine dust limits and filtration requirements.
- Periodically check filter in compressor as bleed lines to avoid the hazard of clogged balance and cooling systems.
- Conduct service tests with a number of aircraft under actual desert conditions to evaluate more accurately the

significance of the sand problem from a safety standpoint.

Compare the vulnerability to sand of the centrifugal flow to axial flow type compressor turbojet (AMC already has scheduled test on the J-31 centrifugal flow turbojet for evaluation against the J-47 and J-35 axial flow engines, currently being tested).

Test Exhaust—First turbojet test conducted by AMC was at Naval Air Station, El Toro, Calif., on a J-47 GE-1 axial flow engine installed in a North American F-100.

The ground test setup consisted of a steel hopper and an injection tube with an air line connected to blow sand into the inlet duct.

The conditions for this test were severe. The sand was about pure SiO₂, with sharp 90 percent size count and 1 percent fines. With fan rotation 100 percent passed through a 14-mesh screen, 85 percent through 25-mesh, 54 percent through 45-mesh, 51 percent through 65-mesh, and 1 percent through 100-mesh.

This material had severe erosion qualities. The sand concentration injected in the engine was 135 lb/sec, at maximum rated power.

Concentration of sand and dust was about 29 times the amount that would be injected into an engine at the same power with dust conditions at the inlet meeting Specification AN-P-10 (Army Navy Specification for Engine Change Air Filter).

The test was terminated after three minutes when a circumferential rupture 1 in. in long and 1/16 in. wide occurred in the exhaust cone 5 in. aft of the turbine timing, probably induced by clogged bearings.

A total of 314.1 lb. of sand had passed through the engine.



Fig. 1 J-47 dust compression, wet test



Fig. 2 J-47 specific fuel consumption data

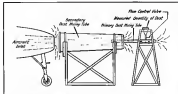


Fig. 3. Dust injection setup for Air Material Channel test run.

all Model type covered for 3 in. air velocity scale. Zigzag airfoiling on curved backs.

- **Turbine dusting rig**—Three 5-in. long and 4-in. wide rotor blades were used between 5, 6, 7, and 8.
- **Expanded cone-bladed back**—3 in. long and 1 in. wide, 3 in. at all of the surface fringe behind blades 6 and 7.
- **Lubrication system**—No sand or oil lines, pumps, pipes, filter or bearings.
- **Air flow—blower**—an blower and air cooling lines packed with sand, permitting little or no effective air flow.
- **Air ducts**—First and fourth stage compressor air ducts blocked, but only second stage air valving surface, and collected in seal protected area in line powder form.
- **Balance**—Compressor static and dynamic balance discharged by dust action.

• **Second Test-Rigged failure of the J-47 engine** during the first test means doubt on the validity of an accelerated test for evaluation of sand and dust effects in a jet turbine. The test AMC set up a similar test on a XF-92A aircraft using a J35-A-15 engine with the objective of duplicating actual operating conditions as closely as possible.

After experimenting with several dust injection methods, the arrangement illustrated in Fig. 3 was adopted. The large amount of dust on an F30 exhaust turbine, large opening facing the test inlet duct. Sand in tube was a 3-in. pipe. A 500-lb. capacity hopper was used with a valve to control sand flow, but the valve was abandoned when it was found impossible to control the flow accurately.

Low pressure zones of the dust inlet produced air flow through both mixing tubes, velocity being dependent on the distance of the large tube from the inlet. Turbulence produced in the large tube thoroughly disturbed the dust over the entire inlet duct to provide external conditions without auxiliary power equipment.

Sand and dust conditions chosen were based on Specification AN-515 as the belief that dust behind these requirements are the most accurate and comprehensive available. The dust concentration was 60 grains/cu ft., the test conditions specified for measuring carburetor air filters. Material was high-alum beach sand and Albany molding sand grade 60 with these particle characteristics: U. S. Std. sieve nos. —50+75, 95+100 percent, —75+100, 20+3 percent, —100+140, 15+3 percent, —140+200, 16+3 percent, and —200+250, 10+3 percent.

• **Operation Phase**—The engine was operated on a power schedule that included start, takeoff, climb, approach, landing, and shutdown. Assuming that 60 grains/cu ft. of dust control at the inlet duct during all these conditions, the dust weight flow per unit of time that would be injected at each of the power conditions was calculated, using the corresponding engine mass air flow at its level. Time allotted for each of the power settings was based on observation of many flights of the F-52, F-46, and F-54.

With the average test for each power condition allowed, total weight of the dust injected by the engine during each setting was calculated. Kilo, 3 sec., 316 grains sand injected, two (160 percent rpm), 4 mm., 3240 grains, total 100 percent rpm, 1 gram., 1620 grains and approach, land, two (100 percent rpm), 4 mm., 3240 grains.

Sand and dust was introduced after each power condition was reached and stabilized. Concentration was kept as close as possible to 60 grains/cu ft. throughout entire period of a given power setting.

• **Engine**—This schedule was followed until engine failure or a sufficient number of takeoffs and landings were accomplished to represent to the second engine overhaul period. For the F-54, assuming a full endurance of 3 hr. per flight, and 190 hr. engine

overhaul periods, this would amount to 50 takeoffs and landings. The engine was subjected to a standard calibration prior to the test to provide a basis for measurement of performance deviations.

After four runs, the turbogrip was removed, partially disassembled and inspected. Very minor erosion was observed. All internal surfaces exposed to airflow were clean, including spark plug electrodes, suggesting possible use of small quantities of dust (1-2 lb.) for periodic cleaning of the engine. The power plant was reassembled and the schedule continued with periodic visual inspection, until 15 runs were completed.

At this point, a hydraulic lock required engine removal for the second time. Erosion was noticeable, but no serious wear was apparent. The engine was reassembled.

The schedule was continued, but after 26 runs—halfway to the 50 hr. overhaul point—the turbogrip broke down because No. 2 bearing failed. After disassembly, the following effects were noted:

- **Engine air filter** were severely clogged with sand and dust. Bearing failure, however, was not clearly the result of the clogged filter, because all filter were clogged and the remaining bearings gave no indication of impending failure. Considerable air flow was still observable through filter, but No. 2 bearing is the most critical and needed an overly probable accelerated failure.

- **Engine was separated on the leading edge of the exhaust ducts in all stages of the compressor, most extensive in the 5, 10, and 11 stages, and most extensive in the 7 stage stage.**
- **Exhaust compressor** contained a considerable quantity of sand and dust with commensurate and heavier erosion and pitting. Damage was not extensive and erosion still could be expected.

- **Compressor blades** showed some pitting on the top half, quite extensive on No. 3 and 4 stages.
- **Certain portions of the aircraft duct with shrouded inlet cones.**

- **All other engine components** showed very little or no erosion. Some minor dynamic balance of compressor and valve were not seriously affected. Vibration readings during the calibration run after the test had improved over readings in the first calibration.

- **Classified depth of fine dust**, found on all surfaces including compressor rotor and turbine blades, indicated air flow conditions as those set herein. This suggests experimental technique similar to the use of streamer for qualitative checks on internal airflow conditions in a turbine.

- **During 26 runs, a total of about**

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Presenting the Collins 17L-2
vhf aircraft transmitter

Development of a full line of navigation and communication equipment for aircraft use in the civil and military markets is continuing, first line project at Collins Radio Company. The purpose is to make available to the aviation industry complete, integrated radio facilities fulfilling all requirements for navigation and communication with the Federal Airways. The program is closely coordinated with, and will progress with, the interim and long range programs of the Radio Technical Commission for Aeronautics.

The new Collins 175-B shown above is a product of this Collins project. It provides transmitting facilities on all channels reserved for aircraft communications in the vhf band.

The 17L-3 transmitter is intended as a companion equipment for either the Collins 50P vhf communication receiver, or the Collins 51R vhf navigation receiver now in almost universal use by the leading airlines of the United States.

121.2 New Products

Power Output: Eight watts or better into a 50 ohm load.
Modulation Capability: Up to 90% on voice from a carbon microphone or on a 1000 cps tone for SSB-W.
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Power Requirements/Standby, transmitter only, 1.0 amp. at 10.5 v d.c. or 2.6 amps. at 13.5 v d.c. Transmitting, 7.0 amp. at 10.5 v d.c. or 18.0 amp. at 13.5 v d.c.

Mechanism: The transmitter is housed in a standard 1/4" ATN size case (JAN 6-14). All power and control connections are made through a cast mounted multi-contact plug. Control connections for antenna and non-polarized receiver connection are mounted on the front panel. Weight of the transmitter is 15 pounds.

We shall be glad to send you more complete information about the Collins 176-L transmitter as requested.



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Fig. 4. 135 short exposures, used for

474.5 lb. of sand and dust passed through the engine. Effect of the test on throat and specific fuel consumption, compared with factory and pre-test calibration runs, is illustrated in

• **J-47 Test Conclusions**—Comparison of results of both tests indicate the J-47 accelerated test, using high sand concentrations in a short period of

Fig. 5. 37% methyl red negative *dsrA*

that, was not a valid evolution, since erosion was much more rapid and severe for an equivalent quantity of sand and dust than when continuous regenerative natural use used.

AMC Engineer DeKromer points out that to arrive at a more accurate evaluation, several factors must be considered in relation to the J 85 test. The first created an extreme condition in that



P&W Readies New Test Facility

A new 512-inches laboratory for Pratt & Whitney Aircraft Division, built expressly to test experimental jet engines, is almost complete and will be put into operation within the next few months.

To be named the Andrew Wilgore Turbine Laboratory, in honor of F&W's chief engineer for twenty-three years, who died earlier this year, the structure is located in Hartford, Conn. It is the main part of a jet development program in which F&W has spent \$15 million over the war's run. The building has 20 windows, is 6 stories high and 400 ft long.

It is equipped with four test cells, with two adjoining chambers at opposite ends of the building. Test cells can be distinguished from the rest of

the structure by the lower steel levels and reinforced concrete walls—two feet thick in some places. The central part of the building has double reinforced walls faced with corrugated sheet.

cynages. A matrix of pipes and tubes, neatly brought into the cells under a grating floor, feed hot or cold, dense or thin air into the cynages or their cone nozzles to regulate light conditions at

Best conditions existed for every simulated attack and landing during the total test. This may not be the case in actual operations.

A separation effect may be increased on the lugs, more slender particles by refuse or inlets of another type than the test soil.

Sand and dust concentrations will be lower in many instances when engines are mounted high on wings.

Dellamora adds, however, that the test might be considered not sufficiently stringent when evaluated in the light of these points:

Control edge operation is used and that may be much longer under certain typical conditions.

Flight time in sand and dust may be longer in regions of frequent storms where airborne dust still can be considerably concentrated at altitudes up to 10,000 ft.

The force exerted on the ground by jet walks in man operations may produce and concentrations greater than that used in the test-based on measurement behind ourselves.

mixed albedos and transparent. The ice can be cooled to -70°F and thrown to create roughness found at 40,000 ft.

To provide power demanded by the jet boats, the central service equipment section of the lab has four large boilers, in addition to four turbo-generators which afford 18,480 kw. The boilers, designed for installation in Navy battle cruisers, were interrupted on the way to the junkyard at the end of the war, and picked up by P&W's purchasing department for a fraction of the cost involved in building new units. The generators similarly were obtained at small cost from returned lend-lease destroyers which were declared surplus.

To meet other testing needs, the lab will take in water at 128,000 gal./mo from the Connecticut River through a 6-ft pipe. Water will be circulated by a 36-ft high pump house and will be

To reduce jet noise on the outside of the left exhaust pipe on their way out from engine testing, you'll have one of these silencing chambers built

of heavy concrete faced with sound sharpening material. Mass jet sand is fed in a labyrinth before the gas is passed into the center air through slots in concrete basins. The solid black

A storage area near the laboratory accommodates about 1100 barrels of jet fuel, and 24,000 barrels of kerosene.

and for the boiler feed of the entire 130-Mw plant.

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ENGINEERING FORUM

Pioneered In Control Almost 20 Years Ago

I want to share with you your article on Servo Control Slide in the Sept. 1958 issue of Aviation Week. You stated:

"Control has been largely a matter of opinion and it was not until 1948 that qualitative aspects of aircraft handling characteristics had evolved to the necessary derivatives and coefficients useful to the aerodynamicist."

I would like to point out that in 1930, Warner Joyce Aircraft Corp. accepted the first contract ever made with the Bureau of Aeronautics to design an airplane to control velocity and pull it out in a predetermined distance.

Naturally, we were interested in strength, stability, controllability, and what might be required of the airplane in the way of equipment and facilities of risk there under varying conditions. We were chiefly with highest possible rates of angular acceleration in yaw, pitch, and roll for maximum stick forces we wanted to use.

Under the guidance of Ed Miller, head, flight characteristics were assigned to the necessary derivatives and coefficients. We were then able to assure us that the airplane had a given maneuverability, stability, and controllability in terms of regular acceleration and rotation with less stick forces in comparison with several other relatively satisfactory airplanes with which we were both familiar.

These derivatives and coefficients were established with wind tunnel data and theoretical analysis of the effects of downwash and dynamic conditions, and taking into account also the friction of the hinges of the total control system.

Some very modified advanced aircraft names resulted from this cooperation. At several NACA conferences during the early '30s, we submitted to get NACA to do for the whole industry and all types of aircraft what we had accomplished at WJ for our own type, and which type we were not accomplished until 1951. The above facts indicate that we were well out in front at that time.

It was because of the knowledge that such things could be done that the proposal was presented at these conferences in an effort to get industry and NACA to reduce their stability, controllability, and maneuvering characteristics in engineering terms instead of merely pilot's response.

It took a decade before NACA and the rest of the industry adopted the same basic approach.

WJ Aircraft actually did it in the '30s and that's my only hope of continuing with one article. Naturally, you did not hear of this and could not refer to it. It was the first advanced thinking of Ed Miller that could be possible, and someone along the line he should be given credit for it.

Wing Engineering Corp.,
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A MESSAGE TO AMERICAN INDUSTRY • 79th OF A SERIES

The Labor Union Monopoly Bites *ALL* Workers

What kind of government is it which:

... Prevents the Great Atlantic & Pacific Tea Company which it asserts handles about 6 1/2% of the retail food distributing business as an illegal monopoly in restraint of trade, and

... Seeks to break up four big meat packing companies and make them into 16 companies, charging the four with being a monopoly in restraint of trade, but

... Makes no move whatsoever to apply the federal anti-trust laws to the exercise of virtually 100 percent monopoly control of labor in the coal industry, and the only slightly less complete monopoly control of labor in the steel industry?

The answer to that question is simple. It is class government of the most flagrant type, a government by which special privileges are dispensed without justice and to the great injury of all workers. It is the kind of government which will lead to the early sacking of the American enterprise system and the personal freedoms of workers.

In legal terms the explanation of this flagrant affront to good government is also simple. In 1932 labor union subsidies were given virtually complete exemption from the application of the federal anti-trust laws by passage of the Norris-LaGuardia Act.

continued on next page

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When the Norris-LaGuardia Act was passed labor unions were relatively weak. Only about 16% of the nation's industrial workers were organized, only about 12% of the steel workers. About two-thirds of the coal miners were union members, but only half that number were paying dues. The country was in the depth of its worst depression. The unemployment of about one-fourth of the labor force made monopoly control by labor seem so remote as to be almost fanciful.

But after only seventeen years devoted to the promotion of labor union organization by the federal government, we have labor monopoly with us. In its power and scope it makes the alleged business monopolies being prosecuted under the federal anti-trust laws seem positively puny. In its manner it makes the old-line business monopolies look like Lord Fauntleroy.

What is lacking, grievously lacking, is action by Congress, action to shape our federal anti-trust laws to take account of the labor monopoly that has become the dominant national force in our country today—a force that is leading to the loss of freedom of all workers.

Before labor monopoly is broken up, as it must be broken up if our economy is not to be permanently wrecked, other steps will no doubt be required, but one fact more than any other will be the touchstone of the nation's determination to keep its economic and personal freedom. It is what it does to see that labor monopoly re-

quires the same treatment under the federal anti-trust laws as any other kind of economic monopoly.

The purpose of the federal anti-trust laws is to break up monopoly and preserve fair competition in the United States. It is a fine purpose. The wisdom and fairness of its application in particular cases is often open to challenge. But in spite of bad administration every thoughtful business man I know is a staunch defender of our national anti-trust policy.

At present, in the exemption of labor monopoly, we have a breach in that policy which, if not closed, will soon become fatal both to the policy and the enterprise system it is designed to foster and protect.

The main thing wrong today with Great Britain and indeed all Europe is that no effective anti-trust laws are in existence to protect the public from business and labor monopolies, to guarantee personal freedom. No free economy in Europe or America can prosper as long as protected monopolies remain and flourish.

While your representatives in Congress are honest with you talk to them about the special privileges now granted to labor union monopoly. You would serve your country well by finding out what they intend to do about it before it is too late.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.



The kid that once was you...

The boy in the window looks upward. His eyes are shining . . . his attention riveted on a plane in the sky.

As you watch him, you know he is not with you at all. He is piloting a plane through wind and clouds to the stars. He is no longer earth-bound—but a man with wings.

You know what he is thinking, for once you stood somewhere—in a window, at a school desk, on a hill—and had the same dream of glory. It was the same dream, and yet it wasn't.

When you were a youngster, chances are your first love affair was with a wire-strutted Jenny, or later, with a Winnie Mae, or a Spirit of St. Louis. Today's youngsters are enchanted with a Buck Rogers world come true—sleek, streamlined rocket planes; planes without pilots; jet-propelled planes that fly faster than sound.

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Right now, almost ten million dollars a day are being spent by the aviation industry to satisfy commercial, private and government needs. Aviation is growing, and it will continue to grow. It will, and it must.

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Materials Conveyor

Portable belt loader, manufactured by Sage Equipment Co., can be used in

floor-to-floor conveyor and stacker. For the three jobs on site's testing results show incorporate safety features permitting conveyor to be locked in any desired location within an eight-foot lift is available with belts 6 to 36 in. wide in length range of 12, 15, 18, 20 and 24 ft.

Motors to operate conveyor are provided in various sizes, depending on load to be carried, and either rider or roller belt construction is available. Unit may be furnished with power driven belt feeder and shoot, roller gravity or sand-on delivery systems. Work carriage of heavy single iron, conveyor runs on two stationary and two moveable casters.

Two floor locks are provided to secure mechanism in desired location.

Vacuum Gage

Vacuum gage for measurements ranging from 1-1000 microns, offered by Hastings Instrument Co., Hampton, Va., is designed for laboratory and production processes involving high vacuum systems. Unit embodies tubular-thorophyll and disposable bellows circuit similar to those used in precision air meters produced by firm. Gage has accurate electrical indicator and dial, rugged pickup which serves with its tapered hole in vacuum system.

Stability of calibration and operation, fast response, reproducibility of readings without recalibration, freedom from outgassing and corrosion, and free drainage by capillary to atmospheric pressure are represented in outstanding features of device. It operates on 115 v. a.c.



Trouble Light

Camelotone Wren Lite and extension cord made by Camelotone Mfg. Co., 1503 Alcott St., Kalamazoo, Mich., is compact unit which can be carried in most tool kit.

For operation on 110 v. a.c., device has 12 in. flexible extension with 10-

pinch rivet to resist wear, and 32-ft. section cord. Light bulb is equipped with 1-in. diameter guard.

Adapter and outlet by firm is Model 400 (receptacle) light having 6-in. rigid extension supporting 3-in. double socket holding light. Bulb is enclosed in sleeve which provides forcing adjustment and incorporates supplying lens.

Portable Welder

To eliminate transporting of materials during construction, mobility in repair, Tool and Equipment Distributors, 816 S. 10 Ave., La Grange, Ill., offers "Big Shot" portable arcwelder supplied in two voltage models.

The 110 v. a.c. unit with 18 to 28 pipe size, 3/16-in. and 1/4-in. throat two pipe thick.

The 230 v. a.c. model welds up to 1-in. thicknesses.

Measuring 4 x 4 x 15 in. and weighing 22 lb., unit can be operated by one hand, leaving other free to position and move work.

Heavily insulated and safe from shock, welder incorporates mechanism adjustable to varying power conditions. When unit is not welding properly, regulator can be turned to another position for better performance. Upper tung in front, lower across. Specifications are 18 in. reach, 5 in. width, 6 in. reach, 7 in. width, 12 in. reach, 11 in. width.

Special alloy tips are adjustable by screwing up or down to suit each operation.

Miniature Tubes

New vacuum tubes for radio transmitters, control equipment, high frequency signal receivers and transmitters, and electronic are announced by Tube Division, General Electric Co., Schenectady, N. Y.

Model GL-5514 is miniature twin triode and is intended for operation where severe shock or prolonged vibration are encountered.

Model GL-5751 is high-vacuum triode designed for long life in interest-free operation.

Heater voltage (a.c. or d.c.) at units is 6.3 at 350 amp. per parallel, and 12 by at 375 amp. per series operation. Maximum plate voltage is 130. Plate dissipation is 1.0 W. for GL-5514 unit, 1.1 W. for GL-5751.

Each unit contains at least 50 hr. battery operation test and heater cycling and prolonged vibration tests. Each contains 2 1/2 in. long, with maximum diameter of 1 in.

engineer's notebook



FOR HANDLING SHOCK LOADS

Secure overflow cylinder to loading gear shimmy dampener with Harmon T-bolt dampers, especially suited to severe shock loads encountered in this installation.



JET ENGINE JOINT CONNECTIONS

Harmon V-Bond couplings provide an efficient seal and facilitate maintenance with quick disconnect provisions of the coupling bolts.



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Holding straps and clamps meet withstand a resultant force in any direction of 2500 lb. Standard Harmon types fulfill all requirements and can be adapted to any specific design.



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Write for copy of Exide Aircraft Catalog, which includes the Exide Battery Price and Replacement Data Sheet.

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SALES & SERVICE



OUTSIDE, Executive Aircraft Center keeps sheltered canopy for weather looking...



... INSIDE, hangar and office headquarters both sides the million-dollar hangar

New Facility for Company Planes

Malford Air Service opens round-the-clock Executive Aircraft Center at Teterboro, N. J., Air Terminal.

Malford Air Service, Inc., this week plans to open its new Executive Aircraft Center, designed to give today's most airline-type service to business executives who operate their own aircraft.

At its Teterboro, N. J., base, Malford's facilities will be housed in a huge hangar, with 15,000 sq. ft. of space and an additional 15,000 sq. ft. for customer shop and office use. According to Robert M. Hewitt, president of the firm which is also Ryan Navion distributor at Teterboro, the Executive Aircraft Center will operate 24 hours a day, providing specialized service for aircraft, crew and passengers.

Included in these services:

- An operations room, with direct line radio weather map transmission from the U. S. Weather Bureau.
- Telephone service between cities.
- Spacious lounge for executive aircraft passengers and another for pilots, both

including private offices, showers and lockers.

• Special limousine service to New York City and other important points in the metropolitan area, service from the city to the airport.

Besides these services, Malford will offer a general parts and accessory department, staffed by shop personnel who are experienced in handling executive aircraft.

The hangar, which Malford is leasing from the Port of New York Authority (owner and operator of Teterboro Air Terminal), is actually large enough to handle Boeing-Stearman's. Doors are 50 ft. high, and the building measures 300 ft. by 163 ft. Office, which will be used by the corporation leasing aircraft at Malford, lies both sides of the building's center walk and extend upward its two floors.

• Unique Dock—One unique feature of the hangar is a weather-protected load-

ing dock. A canopy, extending the full length of the hangar, makes it possible to load and unload in any weather. Alongside the hangar is a 300,000 sq. ft. parking area.

Competition Aircraft Owner Assn., extremely interested in the project, has acquired office space at the center for the use of its members and their pilots. Some of these member companies at study base their aircraft at Malford, including: Washington Mills, Levin Brothers, Calmar Corp. of America and General Foods, Atlanta, Ga., and 15 members of CAA in the New York area and about 65 members altogether. Use of the Malford installation, however, will not be limited to CAA members.

Malford's hangar was originally built by the George M. Hewitt Construction Co., of Hopkirk, N. J. It was sold to the Port of New York Authority for approximately \$1 million.

BRIEFING FOR DEALERS AND DISTRIBUTORS

► **BUSINESS FLYING GAINS**—Flying for business increased in 1948 by approximately 18 percent, according to analysis of a CAA sampling survey of airplane use during the year. Survey indicated a total of 1,750,000 hours of business flying in 1948 as compared to 1,060,000 hours in 1947. Approximately 32,110 planes were used in business flying, as against 34,596 planes in 1947, and average utilization went up from 74 to 80 hr. per The increase was in contrast to a general decline in private and non-scheduled commercial flying of 7 percent from 1947 to 1948, from 16,714,000 hours to a total of 15,130,000 hours.

► **AERONAUTIC FLANGE**—Aeromarine Propellers has issued a bulletin relative to replacement of flange on Model F-200 propellers, as a result of vibration tests showing a type of vibration fatigue in some propellers used on Stearman Model 108, 108-1, 108-2 and 108-3 planes. Bulletin says that CAA decided it was most expedient and economical to modify the propeller flange, rather than try to change the characteristics of the engine, in order to eliminate the vibration. Emergency replacement flanges are being supplied through Aeromarine service stations at \$14 each, plus freight.

Owners of all Model F-200 propellers are asked to acquire at their nearest Aeromarine service station or the home office of Aeromarine, Inc., Rogers Co., Inc., Indianapolis, Ind., for detailed instructions on replacement.

—Alexander McIsaac

On the new GRUMMAN PANTHER

Safety Glass

BY PITTSBURGH



the windshield of the Panther's new G30 as a p.h. jet fighter is ballooning rapidly by "safer" Safety Glass by Pittsburgh. The glass is stronger and resists to the high degree of optical protection required for its use in conjunction with the gyroslating system. It covers the pilot's vision area, even at acute angles.

The aviation industry is making full use of the research and engineering experience, the manufacturing facilities and production skill which Pittsburgh makes available for all aircraft manufacturers, large and small.

Since new developments that contribute to improved operation of today's military and larger civilian aircraft involve improvements in Safety Glasses and glazing techniques, results of the continued aggressive development programs maintained by Pittsburgh Plate Glass Company.

Aircraft design engineers are looking to Pittsburgh constantly, not only for Safety

Glass windshields and windows, but also for gun-sighting bladders, photographic glasses, camera windows and other special clear and glass-and-plastic combinations. Many of the new glazing techniques and methods, such as flash mounting of multiple curved glass panels, were developed "in orbit" by Pittsburgh.

When you are facing problems which involve the use of Safety Glasses in aircraft, bring them to Pittsburgh. Our glass and glazing specialists will be glad to consult with you. Pittsburgh Plate Glass Company, 21844 Grant Building, Pittsburgh 39, Pennsylvania.



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AIR TRANSPORT

Atlantic Mail Pay Confusion

Over-ocean carriers find that earnings fluctuate sharply under CAB's present temporary system of awards.

U.S. big lines operating over the North Atlantic under temporary mail rates are watching their profits or losses bounding up and down by millions of dollars with each new show-down order turned out by the Civil Aeronautics Board.

In recent years, when mail volume was operating at the mid, temporary mail rates have, with few exceptions, been reported as only one disastrous episode. But now CAB is demonstrating that temporary mail pay (with its complicated fee system) is a two edged sword which can slash earnings as well as losses.

Last January, CAB slapped its blade to pare the earnings of a freight operator, Pan Am Lines. Now TWA faces the same prospect because CAB finds it has been making too much money under its temporary mail rate.

► TWA's Pittsburgh-based show-down order requires TWA to explain why its U.S.-Europe Alcoa-Air mail pay for the last six months of 1969 shouldn't be cut to \$6,185,000, about \$1.5 million less than it has received under its present formula. The Board said a study of TWA's books for the year ended Aug. 31, 1969, showed the carrier's international division had a \$5,641,000 operating profit.

Result was a 67 percent rebate after taxes on the company's \$21 million in payment. CAB said this represents an excessive rate of profit. Even with the reduced mail pay, new entrant TWA will have a \$1,766,000 operating profit (on 51.1 percent return on its investment) for the year ended last Aug. 31, according to CAB estimates.

► PAA Questioned—Turning to Pan American Airways' trans-Atlantic operations, CAB told that carrier to show cause why its mail pay for the first six months of 1969 shouldn't be reduced by about \$2.5 million. This would cut PAA's mail revenue for the U.S.-Europe to \$1,093,000 through Oct. 31.

PAA's books for the first six months of this year showed the carrier with a \$1,077,911 net profit on its trans-Atlantic links. However, these earnings were based on intercontinental mail revenue far larger than those received under new Pan Am's present rate in the proposed new and higher rate.

American Overseas Airlines' mail pay for the first 10 months of this year was about right, CAB indicated. Figures for the first three quarters of 1969 showed AOA had registered a \$451,691 net profit.

► Proposed Mailbox—While examining the records showed wide variance trans-Atlantic mail rates, CAB also decided that its method of computing payments may be either too restrictive.

In the past, all three carriers have received mail pay on a plane-mile basis. This gave them the same mail revenue for a mile flown with a DC-3 as with large four-engine aircraft.

According to CAB, the present formula not only restricts a carrier's freedom to vary the composition of its fleet but also results in lower mail pay than extended when operating capacity is offset by higher aircraft flown down plane miles.

► Proposed Formula—To correct the discrepancy, especially for the benefit of PAA and AOA which now operate trans-Atlantic-CAB proposes to add mail payments for trans-Atlantic services on the basis of available seat miles.

Under the proposed formula, available seat miles (compared to month flying, the scheduled plane-mile flown in passenger service during a month) is the standard available seat

for that type of equipment. Standard available seats for the DC-3 under the new setup would be 21, Martin 2-4-2, DC-4 and Constellation, 45, Constellation and DC-6, 45, and Stratoliner, 61.

Mail pay under the proposed formula is still on a temporary basis. Final calculations for 1969 will not be determined until next year at the earliest.

NWA Compares 2-0-2 Costs With DC-3

After two years experience with the new two-engine plane, Northwest Airlines officials estimate that 2-0-2 equipment can be operated at a saving of about 20-25 percent in unit cost over the DC-3, the Cessna E. Murta Co. has announced.

Direct cost per available seat mile is reported as 14.65 cents for the 2-0-2 and 18.85 cents for the DC-3, direct cost per available seat mile, 1.785 cents for the 2-0-2 and 2.28 cents for the DC-3, average seats available per aircraft, 159 for the 2-0-2 and 196 for the DC-3, cost per plane-mile, 68.42 cents for the 2-0-2 and 44.65 cents for the DC-3.

Depreciation for the 2-0-2 is based on five years with a ten percent residual value. Northwest's first scheduled 2-0-2 flight on Nov. 15, 1967.

AOA Engineers Get Pay Hike

In unanimous decision of a three-man arbitration board, American Overseas Airlines flight engineers have been awarded higher wages for several larger and faster aircraft such as the Constellation and Boeing Stratoliner.

The arbitration board found that the



AIR COMMERCE BOOSTERS

New "big five" in the recent election action of the U.S. Department of Commerce are, left to right, C. V. Whitney, Under Secretary of Commerce; D. W. Harrison, Administrator of C&E Administration; Tom

David, Assistant Secretary of Commerce; and Charles Rogers, Secretary of Commerce. Don, former special assistant to United States President; and W. W. Harrison, Administrator of C&E Administration; and Tom

pay of flight engineers and assistant flight engineers but on comparable ratio to that of the pilots. It added that differing duties and responsibilities on the DC-4, Constellation and Stratocruisers should be recognized by differing rates of pay.

■ **Cautious Pay Scale**—For the contract year ended last May 31, the CAA, represented by the Flight Engineers International Association, had a pay scale ranging from \$438 a month for up to six months' service to \$670 monthly after 48 months. Assistant flight engineers earned from \$750 to \$1200 a month. In neither case was there a pay differential for various types of equipment.

The arbitration would give the assistant pay increase for duty aboard DC-4s and Struts of 72,000 lb gross weight or less. But for the period June 1-Nov. 30, 1949, the expenses remained \$15 more monthly for service on Constellation or other aircraft weighing 72,000 lb and 110,000 lb gross weight, and \$50 more monthly for service on Stratocruiser or other aircraft of between 110,000 lb and 175,000 lb gross weight.

For the period Dec. 1, 1949, through May 31, 1950, DC-4 pay remained the same but Constellation pay rose another \$15 monthly (making a total increase of \$70 over last May). While Stratocruiser pay rose \$15 more per month (making a total increase of \$85 over pay recorded last May).

Use the current flight engineers pay scale for the DC-4 is \$420 to \$430 monthly—unchanged from last May. For Constellation the range is \$500 to

\$700 monthly and for Stratocruiser from \$735 to \$735 monthly.

■ **Scale Remains**—Scale for assistant flight engineers on Constellation was raised \$25 a month and on Stratocruiser \$30 a month for the period June 1, 1949, to Nov. 30, 1949. For the period last Dec. 1, 1949, to May 31, 1950, the pay scale up another \$25 a month on Constellation and another \$35 on Stratocruiser.

This raises the current Constellation scale for assistant flight engineers from \$400 monthly for zero to six months' service to \$720 for 35-50 months' service with the airlines.

On Stratocruiser the present range is from \$435 to \$535.

'50 Even Better, Says UAL President

United Air Lines President W. A. Patterson anticipates better 1950 than for his company and the industry generally than was experienced in record-breaking 1949.

This year, UAL expects to carry 2,102,500 passengers. With average regularity and dependability of service, the figure should be topped in 1950, Patterson declared in his semi-annual report on mail, freight and express volume.

During 1949, United operated about 97.5 percent of all scheduled flights. Of those, about 96 percent flew on time or within 15 minutes of schedule, and 71 percent arrived at their final destination within the same time limits or schedule.

Compared with 1948, the performance showed improvements of 1 percent in flights operated, 1 percent in on-time departures and 24 percent in on-time arrivals.

■ **Low Personnel-Patterns** noted that UAL operated with an average of 10,045 employees during 1949 against an average of 10,972 in 1948—a reduction of 7 percent. Even so, available two-weeks increased 10.5 percent.

Partly responsible for the increased economy and efficiency was the growing experience of employees. By the end of 1949, 2.2 percent of all employees had been with United more than 20 years, 12 percent more than 10 years and 32 percent had been with UAL more than five years.

During 1949 (with December estimated) United flew about 1,073,046,000 revenue passenger miles, up 31 percent over 1948. Revenue passenger miles flown decreased 5.5 percent less previous year's figures.

Contributing to UAL's passenger traffic increase was extensive use of the scheduled route, scheduled mail, family plan when it accounted for about 10 percent of the company's passenger-mile total.

Air freight volume totaled about 24,567,000 tons in 1949, up 13 percent over 1948. Annual ton-miles totaled 11,855,000, up 14 percent, and express ton-miles 3,378,000, down 11 percent from last year. About one-third of the air mail total consisted of parcel post.

WAL in Black For Third Quarter

Western Air Lines completed the first nine months of this year with a loss in the black, showing a net profit of \$149,194, compared with a loss of \$59,768 at the same 1949 period.

President Verrell C. Davidson and operating revenues gained \$574,890 over the first three quarters of last year while operating expenses decreased by \$149,817. Only insignificant to the downward cost trend were in flying operations (reflecting increases in pilots' pay, gasoline and insurance) and in depreciation charges (which rose because of the greater number of planes owned and operated).

■ **KFC Loss-Decline**—and said the recently approved reduction and return of WAL's Reconstruction Finance Corp. loans would mean a difference of about \$15 million annually in payments and will reduce the annual principal payments to an extent the equivalent of the carrier's annual depreciation charges.

Under revised terms of the loan, Western will pay KFC \$148,000 a year with any surplus balance becoming due

on Dec. 31, 1951. Previously, the carrier had been making payments at a rate of about \$1.8 million a year, with part of the loan becoming due by payment in 1950.

Western reported its head-end had better was \$7.99 percent for the last nine months of this year, compared with 40.32 percent for the same 1948 period. Break-even had faster for the third quarter of 1949 also was only 41.15 percent.

Joint Study Probes Roads to Airports

Civil Aeronautics Administration and the Bureau of Public Roads have begun a joint study aimed at speeding up ground transportation to and from airports.

CAA Administrator D. W. Renshaw and the two Federal agencies are interested in improving the volume capacity of existing airport highways for the benefit of all road men, whether or not they are airport users. He added that CAA will only be working on the Bureau of Public Roads and on state highway departments for data helpful in implementing its program for improvement of ground transportation along air travel.

■ **Mileage Help**—Regular highway funds will be used under the joint program since no CAA money is available for funds made from the airports. Renshaw said that in many instances ground travel from downtown city areas to airports can be speeded merely by installing low-cost directional markers which point out the shortest route to the particular airport.

In a survey of 99 major U. S. airports made last winter, the American Road Builders' Assn. found that 49 of the fields are 20 minutes or more from the center of their respective communities. Twenty-four of the 99 fields are 30 minutes or more distant from downtown areas.

ARBA stated ground travel time can be cut as average of one third by proposed limited access express highways between the points.

Planes vs. Ships

U. S. Immigration and Naturalization Service reports that of 1,165,514 visas being issued to and from foreign countries during the fiscal year ended last June, 1,073,738 traveled by air against 945,479 by ship. In fiscal 1948, 1,513,661 permits were issued through U. S. Customs, of which planes received 945,479 and ships 568,632.

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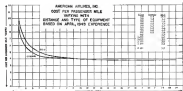
More and more aircraft manufacturers and operators prefer Fenwal aircraft fire detector systems. Based on an entirely new principle of fire detection, these systems combine heat, infrared, rate-of-rise and fixed-temperature detectors for fast detection. You get consistent, positive fire protection on all sizes. Low cost. No maintenance problem. Simple push-button reset check. No bulky gauges, relays or superfluous instrumentation.

Yes, immediately tested units comply with CAA Technical Standard Order C-11 in accordance with Society of Automotive Engineers Specification 48-491.

Further information on request

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AIR COACH ECONOMICS

American Airlines, which recently proposed a new international air coach service at 40 cents per lb, has disclosed these cost figures for its DC-4 operations, based on last April's experience. The data show that on the 2400 sq. cost-to-rent for the cost per passenger mile flown (with a 60% percent load factor) was about \$7.99. The unit is based on American's converted 70-

passenger DC-4s. At the time last June with a 70-passenger coach-type DC-4, AA's cost per passenger mile on the international had previously could be brought below 3 cents. If CAA's operations, American plan to start such operations with 70-passenger DC-4s on Dec. 27, following up with high-capacity DC-4s to go into operation next spring.

Alaskan Nonskeds Voice Protest

They decry "oppressive" Federal regulations which now make passenger carriage economically impracticable.

Non-schedulable carriers on the Pacific Northwest-Alaska route have lodged a letter protest with Alaskan Governor Ernest Gruening against "apparent" regulatory moves by federal agencies in Washington.

Arnon Heacock, president of the Independent Air Carriers' Conference of America and head of Air Transport

Assessment, Inc., a large mortgage originator based at Seattle, told Gov. Governor that all but one of the new standards among Alaska are now involved in C&B collaborative scheme for allegedly fixing two frequently and available.

► **C-46 Restrictions**—In addition, Herrock declared, new CNA executive

limitations affecting passenger-carrying G-4s cut the permissible payload for these craft as much as the Alaskan route as to make flights economically unviable.

Together with IAGCA member John J. Kish, Henschel recently conferred with CAA and CAB officials in Washington and announced that an interpretation of the C-46 ruling had been obtained which will permit operating the craft at the full 45,000-lb maximum gross weight.

At least one noncontractual need—provided its C-46 equipment after CAA imposed the new operating limitations.

Hawson told the Alaskan governor that new runway length requirements prevented unimproved C-46s from using the only civilian airport at Anchorage.

He added that the available military field is restricted to 493 civilian land say a month—all of which have been previously allocated.

■ **Harassment Seta**—The IADCA president and African ministers "intentionally continue to cope with the increased harassment and destructive regulations of C&D plus the millions of dollars of taxpayer funds poured out in support of the closed monopoly of our scheduled (certified) contractors."

INACFT told Gov. Gromming last week that lines serving Anchorage and Fairbanks will agree to post bond to transport the waste to these points and/or contract with the Port Office Department for \$4 per year if no subsidy is granted their subsidized competition. The coalition organizations claim that such revenue received by certified lines operating in Alaska has in many cases exceeded operating expense.

■ **Report hits—**Elmcock declared he had reservations that the CAS examiner's report is the proofing Alaska service that will strengthen the need for additional cargo service to the territory beyond that now provided by certified carriers. But he said the report would deny the need for additional low-cost passenger service to the Alaska region.

According to Blazakis, any serious eastward unscheduled return to cage transportation would destroy the program. He said that there is a possibility no southbound cage from Alaska and that the more conservative passenger street makes it possible for possible to maintain unscheduled tourist operations.

If noncanceled lines are put out at business through a ban on passenger flights, bright sides changed by carbonated lines on the Pacific Northwest Alaska run will (Lyndal, Henschel earned)



WHAT, NO VIDEOS?

New sound towers at Rome, N.Y., support presents the following picture. Operated and equipped by the Civil Aeronautics Administration, the seat is expected to set the pattern for future towers at airports of similar size. Guard Air Lines, which operates into Rome, says the tower has no communication, sound proofing, polished vinyl woodwork, no complete VHF and telephone facilities. Visible on VHF are arriving and departing airplanes, obstructions lights, instrument lights, and flashing light gun (shown in use at night) to direct aircraft with no radio communication. Tower base is 14 ft square; the ceiling is 20 feet square.

Colonial Suffers Court Setback

Colonial Airlines has taken a major setback in its court fight against the U.S.-Canadian air transport agreement, at least one which gives Trans-Canada Air Lines a competitive route to spots on the run between Montreal and New York.

In a two-hour decision, a special U.S. court in Washington, D.C., dismissed Colombia's suit, which contested the constitutionality of the foreign currency parcel seizures of the Civil Assets forfeiture Act; charged that the U.S. Consulate acted in violation, and asserted that granting U.S. status to TCA violates the anti-trust laws. Colombia also claimed that its vested property rights in the New York-Manhattan route were being taken away without due process of law by virtue of a conspiracy by GMB members.

Earlier, Colonial had obtained a temporary injunction preventing GAO from making any recommendations on the TCA case to President Truman, who must approve new foreign aid contracts. Colonial now plans to take its case to the U. S. Circuit Court.

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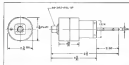
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Willis Appointed Deputy Officer

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RED BANK DIVISION of

Eyal Shalev, H. J.



New York: 1976.

Creeping, Advancing Bureaucracy

Acceptance of industry nullifies the airlines' plight of aerodynamic over-regulation, aircraft manufacturers watch the trend toward domination of research and design by the Federal government, the airlines railroad rate passenger fares again, and we hear ever warnings of another step toward nationalization of all transportation. Can they step forward favoring advances in light aircraft design and the lightplane industry over "government interference with business"?

AMERICAN Wicks believe important the challenging where by James F. Ryan before station Southern great, an unimpaired level. It looks more a significant threat to the airlines, whether manufacturing, transportation or operation.—K.H.W.

Our first line of defense is not the Bible or the Koran; it is a sword, sword American citizens. And that sword is our conscience.

The spirit of self-reliance that motivated the early settlers and for want that a citizen expects no people to exercise their rights and develop this country, while preserving their independence, is unfortunately disappearing from the people.

Too many people are using the Federal government to perform the functions of state governments. Too many people want to lean upon the government, forgetting that the government must lean upon the people. Too many people are thinking of society instead of opportunity. They must move ahead at life then of death.

We are engaged in a cold war with the Soviet Republic. It is a clash between our ideologies—our system of free enterprise and Russia's communism.

You cannot convince people who are willing to communism of the superiority of our system of free enterprise simply by talking about a high standard of living. We live well, but we are slaves of people who are more interested in liberty than in freedom.

We must emphasize the freedom of the individual who by his activities has made America progressive. And we cannot give him heart of freedom without the freedom of the people. We are going to change that system and force the people to remember more freedom to a uncontrolled government.

When we see the slaves of Western Europe and East Russia, which have endured socialism, unable to stand on their own feet and the very existence of their governments dependent upon the taxpayers of the United States, it would seem prudent for us to hold fast to our system of government that has proved efficient as we read in peace, and put our freedom home in order.

Indeed, if, we are dissatisfied with the concentration in Washington of the centers of local governments, including police powers, and with the imposition of, clogging, but ever advancing outside progress. To pay for these early progress we are going to become more money. It is well to remember that if we are unable here is no Land Law or Marshall aid for us.

Many people are deluded! But those who look with free eyes the trend of political thinking may as well be satisfied. They should realize that if a proposal for the spending of money is introduced by the Congress in promoting the general welfare clause of the Constitution, it will be retained by the Court. Therefore, those who wish to preserve people's rights and prevent the gradual absorption of local government by a big government in Washington, with vesting authorities upon one function, should look to the people.

It will serve no useful purpose to argue to them about the rapid of Federal aid lines which are in operation and to which opposition the states have adjusted their budgets. But we can oppose their expansion until our budget permits it. And we can oppose the absorption of new and ready progress that other governments have tried and now wish to eliminate.

It will serve no useful purpose to read out their loss in criticism the political parties or individuals responsible for the growth of the Federal aid system. No party or individual is entitled to a monopoly of the blame or credit.

We could not have an over-capacitated government if the people were conscious of the lines they are passing to the Federal government. When the government required compliance to withhold account from those employees the government put the words to sleep.

In the last fiscal year to present time, the Federal government collected \$35 billion in taxes. The government did not use within six months. We spent \$40 billion and had to borrow \$5 billion to pay our current bills.

We are continuing to spend more than our income. Without adding one of the various new programs, equal by those in power, it is conservatively estimated that during the last year, which will end June 30, 1938, we will spend \$5 billion to \$7 billion more than our income. If Congress adopts their new program no more will nearly how much we will have to borrow, or how where we will borrow it. We do know that new programs must pay it off or should think about of the vast production and loss of the next election.

The speaker, while depicting deficit spending, asked us to recall that these were deficit spending during the Roosevelt administration. That would not necessarily make it right. But who can forget that in 1931 the banks of the nation were closed, farmers whose mortgages were foreclosed were leaving the farms, business was slow and the unemployed walked the streets hungry?

Only a speaker with no sense of responsibility could fail to see the difference. Today the banks have more money on deposit than ever before in previous history. Farmers are reasonably prosperous. Few families are idle. More men are employed than ever before and the people are better fed and better clothed. It is a miracle and we have "unemployed property." If our government cannot live but within its income, what will it do should we have a serious economic situation?

To partly spending more than we receive, save present speed of what the government is doing for the "little fellow." The government is making the small man smaller every day.

The money working man must work 47 days a year to earn the money necessary to pay his taxes to the Federal government. That is almost one day out of every week. If the new program now seriously proposed should be adopted he will have to pay in taxes the equivalent of his wages for an additional 21 days, making 68 days he will work each year for the government instead of the himself and his family.

If the government really wants to help the little fellow, they should allow him to keep more of the money he gets for his labor to spend as he pleases, instead of having it taken from him and sent to Washington to let bureaucrats spend as they think it should please him.

Men educated with power will never voluntarily surrender the power to spend the money of other people. Human nature does not change.



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